

AMENDMENTS TO THE CLAIMS

Listing of claims:

1. (Currently Amended) A vibration damping apparatus for reciprocating drive, to dampen vibration occurring upon conversion of rotary motion, from a rotation outputting shaft of a rotation drive source, to reciprocal motion in a reciprocating drive direction, comprising:

a first conversion mechanism, the first conversion mechanism including having a first rotary shaft, a first counterweight connected to the first rotary shaft, and a first drive shaft connected to the first counter weight, the first drive shaft being connected to the first counter weight at a first drive position, the first drive position being eccentric with respect to ~~provided eccentrically from~~ the first rotary shaft, to convert a rotary motion of the first rotary shaft to reciprocal motion, via the first drive shaft at the first drive position, in the direction of the reciprocating drive direction, wherein ~~the first conversion mechanism further including a~~ the first counter weight ~~having~~ has a center of gravity in a position on a side symmetric with the first drive position with respect to the first rotary shaft, for balancing an offset load occurring upon motion conversion;

a second conversion mechanism, the second conversion mechanism including having a second rotary shaft, a second counterweight connected to the second rotary shaft, and a second drive shaft connected to the second counterweight, the second drive shaft being connected to the second counter weight at a second drive position, the second drive position being eccentric with respect to ~~provided eccentrically from~~ the second rotary shaft, to convert a rotary motion of the second rotary shaft to reciprocal motion, via the second drive shaft at the second drive position, in the direction of the reciprocating drive direction, the second conversion mechanism being provided in pair with the first conversion mechanism so as not to be in contact with the first conversion mechanism and arranged symmetric with the first conversion mechanism with respect to a reference virtual plane parallel with the reciprocating drive direction and the second rotary shaft rotating at equal speed reverse to and parallel with the first rotary shaft so that a reciprocal motion in the reciprocating drive direction is included in the second drive position synchronously with a reciprocal motion converted by the first conversion

mechanism, wherein ~~and the second conversion mechanism further including a~~ the second counter weight provided in pair with the first counter weight ~~and having~~ has a center of gravity in a position on a side symmetric with the second drive position with respect to the second rotary shaft, for balancing an offset load occurring upon motion conversion; and

a combining mechanism to extract and combine reciprocal motions in the reciprocating drive direction which is converted from rotary motions by the first conversion mechanism and the second conversion mechanism, respectively,

rotary driving force from the rotation drive source being transmitted via a belt to the first conversion mechanism and the second conversion mechanism.

2. (Original) The vibration damping apparatus for reciprocating drive of claim 1, further comprising:

a third counter weight provided on a third rotary shaft parallel with the first rotary shaft and rotating reverse at a rotational speed twice a rotational speed of the first rotary shaft, the third counter weight being lighter in weight than the first counter weight and eccentric in center-of-gravity position with respect to the third rotary shaft; and

a fourth counter weight provided in pair with the third counter weight and arranged symmetric with the third counter weight with respect to the reference virtual plane, the fourth counter weight being provided on a fourth rotary shaft parallel with the second rotary shaft and rotating reverse at a rotational speed twice a rotational speed of the second rotational shaft, the fourth counter weight being lighter in weight than the second counter weight and eccentric in center-of-gravity position with respect to the fourth rotary shaft.

3. (Previously Presented) The vibration damping apparatus for reciprocating drive of claim 1, wherein the combining mechanism carries out the combining so that the drive direction is on the reference virtual plane.

4. (Currently Amended) The vibration damping apparatus for reciprocating drive of claim 1, wherein the first conversion mechanism and the second conversion mechanism are crank mechanisms each provided with a crank rod,

respectively, the crank rod for the first conversion mechanism having one end pivotably and displaceably coupled to the first drive position via the first drive shaft and the crank rod for the second conversion mechanism having one end pivotably and displaceably coupled to the second drive position via the second drive shaft;

the combining mechanism including

coupling members pivotably and displaceably coupled to other ends of crank ~~reads~~ rods of the first conversion mechanism and second conversion mechanism, respectively, and

a guide mechanism for guiding a reciprocal motion combined by the coupling member, in the drive direction.

5. (Previously Presented) The vibration damping apparatus for reciprocating drive of claim 4, wherein center-of-gravity positions of the first and second counter weights and the drive direction are on a virtual plane perpendicular to the reference virtual plane.

6. (Currently Amended) A vibration damping apparatus for reciprocating drive, for damping vibration occurring upon conversion of rotary motion into reciprocal motion, comprising:

a first conversion mechanism to convert a rotary motion of a first rotary shaft so that a reciprocal motion in a drive direction perpendicular to the first rotary shaft is included in a drive position provided eccentrically from the first rotary shaft, the first conversion mechanism including a first counter weight having a center of gravity in a position on a side symmetric with the drive position with respect to the first rotary shaft, for balancing an offset load occurring upon motion conversion;

a second conversion mechanism, provided in pair with the first conversion mechanism and arranged symmetric with the first conversion mechanism with respect to a reference virtual plane parallel with the drive direction, to convert a rotary motion of a secondary rotary shaft which rotates at equal speed reverse to and is parallel with the first rotating shaft so that a reciprocal motion in the drive direction is included in a drive position provided eccentrically from the second rotary shaft, synchronously with a reciprocal motion converted by the first conversion mechanism, the second conversion mechanism including a second counter weight provided in pair with the first counter

weight and having a center of gravity in a position on a side symmetric with the drive position with respect to the second rotary shaft for balancing an offset load occurring upon motion conversion;

a combining mechanism to extract and combine together reciprocal motions in the drive direction converted from rotary motions by the first conversion mechanism and the second conversion mechanism, respectively;

a rotation drive source to drive a rotation output from a driving pulley;

a first driven pulley provided on the first rotary shaft;

a second driven pulley provided on the second rotary shaft so as to be paired with the first driven pulley;

an idle pulley provided so as to freely rotate; and

a belt stretched over the driving pulley, the first driven pulley, the second driven pulley and the idle pulley, to convey a rotation drive force from the driving pulley to the first driven pulley and the second drive pulley, so that rotational directions of the rotation drive force become different between the first driven pulley and the second driven pulley.

7. (Previously Presented) A cutting head comprising:
the vibration damping apparatus for reciprocating drive according to claim 1,
the cutting head reciprocally driving a cutting blade on a reciprocal motion combined by the combining mechanism.

8. (Previously Presented) The vibration damping apparatus for reciprocating drive of claim 2, wherein the combining mechanism carries out the combining so that the drive direction is on the reference virtual plane.

9. (Currently Amended) The vibration damping apparatus for reciprocating drive of claim 2, wherein the first conversion mechanism and the second conversion mechanism are crank mechanisms each provided with a crank rod, respectively, the crank rod for the first conversion mechanism having one end pivotably and displaceably coupled to the first drive position via the first drive shaft and the crank rod for the second conversion mechanism having one end pivotably and displaceably coupled to the second drive position via the second drive shaft;

the combining mechanism including
coupling members pivotably and displaceably coupled to other ends of crank ~~roads~~ rods of the first conversion mechanism and second conversion mechanism, respectively, and
a guide mechanism for guiding a reciprocal motion combined by the coupling member, in the drive direction.

10. (Currently Amended) The vibration damping apparatus for reciprocating drive of claim 3, wherein the first conversion mechanism and the second conversion mechanism are crank mechanisms each provided with a crank rod, respectively, the crank rod for the first conversion mechanism having one end pivotably and displaceably coupled to the first drive position via the first drive shaft and the crank rod for the second conversion mechanism having one end pivotably and displaceably coupled to the second drive position via the second drive shaft;

the combining mechanism including
coupling members pivotably and displaceably coupled to other ends of crank roads of the first conversion mechanism and second conversion mechanism, respectively, and
a guide mechanism for guiding a reciprocal motion combined by the coupling member, in the drive direction.

11. (Previously Presented) A cutting head comprising:
the vibration damping apparatus for reciprocating drive according to claim 2,
the cutting head reciprocally driving a cutting blade on a reciprocal motion combined by the combining mechanism.

12. (Previously Presented) A cutting head comprising:
the vibration damping apparatus for reciprocating drive according to claim 3,
the cutting head reciprocally driving a cutting blade on a reciprocal motion combined by the combining mechanism.

13. (Previously Presented) A cutting head comprising:
the vibration damping apparatus for reciprocating drive according to claim 4,

the cutting head reciprocally driving a cutting blade on a reciprocal motion combined by the combining mechanism.

14. (Previously Presented) A cutting head comprising:
the vibration damping apparatus for reciprocating drive according to claim 5,
the cutting head reciprocally driving a cutting blade on a reciprocal motion combined by the combining mechanism.

15. (Previously Presented) A cutting head comprising:
the vibration damping apparatus for reciprocating drive according to claim 6,
the cutting head reciprocally driving a cutting blade on a reciprocal motion combined by the combining mechanism.